This listing of claims replaces all prior versions, and listings of claims in the instant application:

Listing of Claims:

45. (Previously Presented) A method for measuring the lifetime of objects in a garbage-collected system, the objects organized in a graph structure, the method including:

maintaining a reference count for one or more of the objects, said reference count indicating the number of incoming pointers to each object;

recording a timestamp for an object when said reference count for said object changes;

reviewing in reverse chronological order said timestamps for each of said objects which are cyclic garbage, and for each timestamp found:

indicating that the object corresponding to said timestamp is dead; and

indicating that any object reachable from said object corresponding to said timestamp is dead.

46. (Previously Presented) The method of claim 45, further including executing a garbage collection, said garbage

GUNNISON, McKAY &
HODGSON, L.L.P.
Garden West Office Plaza
1900 Garden Road, Suite 220
Monterey, CA 93940
(831) 655-0880
Fax (831) 655-0888

Page 2 of 13

collection indicating one or more objects which are cyclic garbage.

47.   (Previously Presented)   The method of claim 45, wherein said timestamp is a counter which is incremented on a pointer store.

48.   (Previously Presented)   The method of claim 45, wherein the lifetime of an object is the period between the time it is created and the time it dies.

49.   (Previously Presented)   The method of claim 48, wherein the time an object dies can be traced to the timestamp of when it was indicated the object was dead.

50.   (Previously Presented)   The method of claim 45, wherein each time a change is made to the graph structure, a record is generated, one field in said record being said timestamp.

51.   (Previously Presented)   The method of claim 45, further including repeating said reviewing each time a garbage collection is executed.

52.   (Previously Presented)   The method of claim 46, wherein said executing includes detecting objects which are cyclic garbage by invoking a tracing collector.

53.   (Previously Presented)   The method of claim 52, wherein said tracing collector is a mark-sweep collector.

54.   (Previously Presented)   A method for measuring the lifetime of objects in a garbage-collected system, the objects organized in a graph structure, the method including:

recording a timestamp for an object when said reference count for said object is decremented;

executing a garbage collection, said garbage collection indicating one or more objects which are cyclic garbage;

reviewing in reverse chronological order said timestamps for each of said objects, and for each timestamp found:

if said object is cyclic garbage:

indicating that the object corresponding to said timestamp is dead; and

indicating that any object reachable from said object corresponding to said timestamp is dead.

55.   (Previously Presented)   The method of claim 54, wherein said timestamp is a counter which is incremented on every pointer deletion.

56.   (Previously Presented)   The method of claim 54, wherein the lifetime of an object is the period between the time it is created and the time it dies.

57.   (Previously Presented)   The method of claim 56, wherein the time an object dies can be traced to the timestamp of when it was indicated the object was dead.

58.   (Previously Presented)   The method of claim 54, wherein each time a change is made to the graph structure, a record is generated, one field in said record being said timestamp.

59.   (Previously Presented)   The method of claim 54, further including repeating said reviewing each time a garbage collection is executed.

60.   (Previously Presented)   The method of claim 54, wherein said executing includes detecting objects which are cyclic garbage by invoking a tracing collector.

61.   (Previously Presented)   The method of claim 60, wherein said tracing collector is a mark-sweep collector.

68.   (Previously Presented)   An apparatus for measuring the lifetime of objects in a garbage-collected system, the objects organized in a graph structure, the apparatus including:

means for maintaining a reference count for one or more of the objects, said reference count indicating the number of incoming pointers to each object;

means for recording a timestamp for an object when said reference count for said object changes;

means for reviewing in reverse chronological order said timestamps for each of said objects which are cyclic garbage, and for each timestamp found:

indicating that the object corresponding to said timestamp is dead; and

indicating that any object reachable from said object corresponding to said timestamp is dead.

69.   (Previously Presented)   The apparatus of claim 68, further including means for executing a garbage collection,

said garbage collection indicating one or more objects which are cyclic garbage.

70. (Previously Presented) The apparatus of claim 68, wherein said timestamp is a counter which is incremented on a pointer store.

71. (Previously Presented) The apparatus of claim 68, wherein the lifetime of an object is the period between the time it is created and the time it dies.

72. (Previously Presented) The apparatus of claim 71, wherein the time an object dies can be traced to the timestamp of when it was indicated the object was dead.

73. (Previously Presented) The apparatus of claim 68, wherein each time a change is made to the graph structure, a record is generated, one field in said record being said timestamp.

74. (Previously Presented) The apparatus of claim 68, further including means for repeating said reviewing each time a garbage collection is executed.

75.   (Previously Presented)   The apparatus of claim 69, wherein said executing includes detecting objects which are cyclic garbage by invoking a tracing collector.

76.   (Previously Presented)   The apparatus of claim 75, wherein said tracing collector is a mark-sweep collector.

77.   (Previously Presented)   An apparatus for measuring the lifetime of objects in a garbage-collected system, the objects organized in a graph structure, the apparatus including:

  means for recording a timestamp for an object when said reference count for said object is decremented;

  means for executing a garbage collection, said garbage collection indicating one or more objects which are cyclic garbage;

  means for reviewing in reverse chronological order said timestamps for each of said objects, and for each timestamp found:

    if said object is cyclic garbage:

      indicating that the object corresponding to said timestamp is dead; and

      indicating that any object reachable from said object corresponding to said timestamp is dead.

78. (Previously Presented) The apparatus of claim 77, wherein said timestamp is a counter which is incremented on every pointer deletion.

79. (Previously Presented) The apparatus of claim 77, wherein the lifetime of an object is the period between the time it is created and the time it dies.

80. (Previously Presented) The apparatus of claim 79, wherein the time an object dies can be traced to the timestamp of when it was indicated the object was dead.

81. (Previously Presented) The apparatus of claim 77, wherein each time a change is made to the graph structure, a record is generated, one field in said record being said timestamp.

82. (Previously Presented) The apparatus of claim 77, further including means for repeating said reviewing each time a garbage collection is executed.

83. (Previously Presented) The apparatus of claim 77, wherein said means for executing includes means for detecting

objects which are cyclic garbage by invoking a tracing collector.

84. (Previously Presented) The apparatus of claim 83, wherein said tracing collector is a mark-sweep collector.

85. (Previously Presented) A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for measuring the lifetime of objects in a garbage-collected system, the objects organized in a graph structure, the method including:

maintaining a reference count for one or more of the objects, said reference count indicating the number of incoming pointers to each object;

recording a timestamp for an object when said reference count for said object changes;

reviewing in reverse chronological order said timestamps for each of said objects which are cyclic garbage, and for each timestamp found:

indicating that the object corresponding to said timestamp is dead; and

indicating that any object reachable from said object corresponding to said timestamp is dead.

86.   (Previously Presented)   A program storage device
readable by a machine, tangibly embodying a program of
instructions executable by the machine to perform a method for
measuring the lifetime of objects in a garbage-collected
system, the objects organized in a graph structure, the method
including:

recording a timestamp for an object when said
reference count for said object is decremented;

executing a garbage collection, said garbage
collection indicating one or more objects which are cyclic
garbage;

reviewing in reverse chronological order said
timestamps for each of said objects, and for each timestamp
found:

if said object is cyclic garbage:

indicating that the object corresponding to said
timestamp is dead; and

indicating that any object reachable from said
object corresponding to said timestamp is dead.